Authors

Norman Braslau

B.S., 1951, Texas A. & M. College; M.S., 1952, Ohio State University; Ph.D. in Physics, 1960, University of California, Berkeley. Physicist, Air Force Cambridge Research Center, 1952–1955, during tour of active duty, USAF; Staff Member, Lawrence Radiation Laboratory, Berkeley, 1960; visiting fellow in the laboratory of Prof. A. Kastler, École Normale Supérieure, Paris, under grant from Office of Naval Research, 1960–1961. Joined IBM in 1961 at Thomas J. Watson Research Center. Has done research on optical masers and non-linear optical effects and is now working on microwave oscillations in GaAs. Member of American Physical Society and Sigma Xi.

James H. Butler

B.S. in Physics, 1957, Case Institute of Technology; M.S. in Physics, 1961, University of Illinois. Joined IBM in 1957 at the Data Systems Division Development Laboratory, Poughkeepsie. Presently engaged in high speed tunnel diode development at the Poughkeepsie Components Division Laboratories.

Dudley A. Chance

B.S., 1959; M.S., 1960; Ph.D., 1963, all in Engineering Science, University of California, Los Angeles. Research Assistant, 1959–1963, Ramo Foundation Fellow 1962–63, both at U. C. L. A. Joined IBM Components Division in 1963 at Poughkeepsie. Member of Sigma Xi.

Henry M. Gladney

B.A. in Physics and Chemistry, 1960, University of Toronto; A.M., 1962, and Ph.D., 1963, both in Chemistry, Princeton University. Held the Porter Ogden Jacobus Fellowship, 1962–63, Princeton University. Joined the Physics Department at IBM Research Laboratory at San Jose in 1963. Is now working in theoretical chemistry concerned with the description of chemical bonding in small molecules. Worked on semiempirical theory of benzenoid hydrocarbons, atomic correlation energies, and analysis of spectra. Current interests involve the EPR and chemical bonding of transition metal fluorides. Member of ACS, APS, and Sigma Xi.

J. B. Gunn

B.A., 1948, Cambridge. Was Research Engineer, Elliott Bros. Ltd., (London) 1948 to 1953. Awarded Junior Research Fellowship, Royal Radar Establishment, Great Malvern, 1953 to 1956. Assistant Professor, Physics Department, University of British Columbia, 1956 to 1959. Joined IBM Research at Poughkeepsie, 1959. Is now Staff Member, Research Division, Yorktown.

Samuel S. Im

B.A. in Physics and Mathematics, 1957, Grinnell College. Joined IBM in 1959 at the Data Systems Division Development Laboratory, Poughkeepsie, where he worked in the Advanced Semiconductor Device Development Department. He is presently engaged in high speed tunnel diode development in the IBM Components Laboratories, Poughkeepsie.

David P. Kennedy

Member of Radiation Laboratory, MIT, 1940–42, engaged in the design of radar equipment. From 1942–58 was employed by Raytheon Manufacturing Company as a Senior Engineer, working in the fields of microwave tubes, microwave communication systems, and semiconductor devices. Instructed at the Graduate School of Engineering, Northeastern University, 1953–58. Joined the IBM Development Laboratory, Data Systems Division, Poughkeepsie, in 1958 as an Advisory Physicist in the mathematical analysis of boundary value problems, relating to the design and development of semiconductor devices. Is presently a Senior Physicist and Manager of Semiconductor Device Theory in the Components Division, Poughkeepsie. Member, American Physical Society.

Gordon J. Lasher

B.S. in Physics, 1949, Rensselaer Polytechnic Institute; Ph.D. in Theoretical Physics, 1953, Cornell University. Was staff member of the University of California Radiation Laboratory at Livermore, California, 1953–54. Joined IBM Research Computing Center at Poughkeepsie in 1954 and worked on computing methods for physical problems. Is now member of the Solid State Science Department of the IBM Research Division, and has done research in irreversible statistical mechanics and its application to quantum mechanics of information theory. More recently he has made contributions to the theory of operation of injection lasers and is currently working the physics of Type II superconductors. Member of American Physical Society and Sigma Xi.

John C. Marinace

B.S. in Physics, 1949, University of Denver. Joined the General Electric Company, Schenectady, in 1949. Continued working in the semiconductor field after joining IBM Research Laboratory at Poughkeepsie in 1956. Recently has been working in the field of GaAs injection lasers at Research Division, Yorktown. Member of Sigma Pi Sigma, the American Physical Society and IEEE.

Mitchell P. Marcus

B.I.E., 1948, Ohio State University. Joined IBM in 1948 and is present a Senior Engineer in Advanced Technology at the General Products Division Development Laboratory in Endicott, New York. Principal interest is in the theory of switching circuits and its application to the logical design of IBM products. Also teaches courses in Switching Circuits at IBM, and is the author of a book, *Switching Circuits for Engineers*, Prentice-Hall, Inc. Member of Phi Lambda Phi and Tau Beta Pi.

Paul M. Marcus

B.A., 1940, Columbia University; Ph.D. in Chemical Physics, 1943, Harvard University. Worked on waveguide theory and the *Waveguide Handbook* at Radiation Laboratory, MIT, 1943–1948; was scientific liaison officer in London for U. S. Office of Naval Research, 1948–1950; member of Physics Department of University of Illinois, 1950–1952, and Carnegie Institute of Technology, 1952–1959. Joined IBM Research Center in 1959 and has worked on superconductivity, energy bands, and vibration spectra of solids. Is a fellow of the American Physical Society and a member of The Physical Society, London.

Philip C. Murley

B.A. in Mathematics, 1956, Northwestern University; M.S. in Mathematics, 1957, University of Illinois. Joined IBM in 1957 as a programmer in the Scientific Computation Department of the Data Systems Division, Poughkeepsie. Transferred in 1961 to the Components Division to do mathematical analysis and programming relating to semiconductor device theory.

Daniel W. Murphy

B.S. in Electrical Engineering, 1961, University of Illinois. Joined IBM in Poughkeepsie in 1961. Since then has been engaged in high-speed circuit development in the Components Division.

Redmond R. O'Brien

B.S. in Mathematics, 1953; M.S. in Mathematics, 1954; and Ph.D. in Mathematics, 1957, Massachusetts Institute of Technology. Joined Sylvania Electric in 1958 as a member of the Operations Research and Mathematical Analysis Department of the Applied Research Laboratory. Worked on communication and detection problems in noisy environments. In 1960 joined IBM Components Division in Poughkeepsie, working on the theoretical analysis of semiconductor devices and associated computational problems. Is a member of Sigma Xi, The American Mathematical Society, The Mathematical Association of America, and The American Statistical Association.

Richard F. Rutz

A.B. in Mathematics, 1941, Shurtleff College; M.S. in Physics, 1947, State University of Iowa. Worked in the Electronics Sections of the Research Division of Sandia Corporation, 1948–1951. Joined IBM Research Department in 1951 and is now at the Thomas J. Watson Research Center. Has done research on semiconductor devices including transistors, tunnel diodes and, currently, injection lasers and related devices. Member, American Physical Society and IEEE.

William V. Smith

A.B. in Physics, 1937, M.A. in Physics, 1939, Ph.D. in Physics, 1941, Harvard University. Staff Member, MIT Radiation Laboratory 1942–1945, engaged in research on microwave magnetrons. Assistant and Associate Professor of Physics and Associate Director of microwave spectroscopy laboratory, Duke University, 1946–1951; Professor of Physics and Department Chairman, University of Delaware, 1951–1956. Scientific panel of Office of Ordinance Research, U. S. Army, 1951, 1954. Coauthor, *Microwave Spectroscopy*, Wiley, 1953. Joined IBM Research Center in 1956 in microwave laboratory. Presently manager of general physics in the solid state physics and chemistry group of the physical science department at the IBM Research Division. Fellow, AAAS and APS. Member, Phi Beta Kappa, Sigma Pi Sigma, Sigma Xi, Pi Mu Epsilon. Secretary-Treasurer of the Division of Solid State Physics, American Physical Society, 1964–1965; Vice-Chairman of the New York State Section, American Physical Society, 1963–1965.

John L. Staples

AAS, 1956, Radio Communications and Electronics, University of the State of New York. Joined IBM Research in 1956 as a technician in the Semiconductor Device Characterization Group, building special high-frequency transistor test equipment. Served two years in U.S. Army as Radio Teletype Communications Specialist. Presently Research Assistant in the Solid State Electronics Department, IBM Watson Research Center.

Jerome D. Swalen

B.S. (with high distinction) in Chemistry and Physics, 1950, University of Minnesota; A.M. in Physics, 1954, and Ph.D. in Chemical Physics, 1956, both from Harvard. During the course of graduate studies he held fellowships from the Harvard Foundation and the National Science Foundation. Dr. Swalen has done research in microwave spectroscopy and magnetic resonance and has 25 articles published in these fields. He is currently Manager of the San Jose Research Laboratory. He is a member of Phi Beta Kappa, the American Physical Society, the American Chemical Society, the Physical Society of Japan, the Western Spectroscopy Association, and is a Fellow of the American Association for the Advancement of Science.

John R. Turnbull

A.B., 1957; M.S., 1958, Dartmouth College. Since joining IBM in 1958, has worked on the development of high-speed switching circuits. Is presently at the Components Division Laboratories in Poughkeepsie.

July 1964 Vol. 8, No. 3

• *Semimetals Articles:*

Crystal Chemistry and Band Structures of the Group V Semimetals and the IV-VI Semiconductors
by Morrel H. Cohen, L. M. Falicov and Stuart Golin 215

The Effective g-factor of Holes in Bismuth
by G. E. Smith, G. A. Baraff and J. M. Rowell 228

High Field Galvanomagnetic Effects in Bismuth
by Joseph J. Vuillemin 232

Piezo-Resistance and Piezo-Hall Effect in Bismuth
by A. L. Jain and R. Jaggi 233

Phonon Dispersion Curves in Bismuth
by J. L. Yarnell, J. L. Warren, R. G. Wenzel and S. H. Koenig 234

Transport Properties and Band Structures in Bismuth, Antimony and Their Alloys
by J. J. Hall and S. H. Koenig 241

Cyclotron Resonance and the Fermi Surface of Antimony
by W. R. Datars and J. Vanderkooy 247

Growth and Transport Properties of Bi-Sb Single Crystal Alloys
by Dale M. Brown and S. J. Silverman 253

Energy Band Structure of Graphite
by J. W. McClure, Jr. 255

The Fermi Surface of Graphite
by Mildred S. Dresselhaus and John G. Mavroides 262

Change in Fermi Surfaces of Graphite by Dilute Acceptor Doping
by D. E. Soule 268

STB Model and Transport Properties of Pyrolytic Graphites
by Claude A. Klein 274

Alfvén Wave Propagation in Bismuth: Quantum Oscillations of the Fermi Surface
by G. A. Williams and G. E. Smith 276

Infrared Reflectivity of Bismuth in the Quantum Limit
by L. Charles Hebel 284

Acoustic Plasma Waves in Semimetals
by A. L. McWhorter and W. G. May 285

Effect of the Self-Magnetic Field on Galvanomagnetic Effects in Bismuth
by S. Tosima and R. Hirota 291

Non-Ohmic Conduction in Bismuth
by W. Schillinger 295

• *Regular Articles:*

Linear and Nonlinear Methods in Pattern Classification
by H. J. Greenberg and A. G. Konheim 299

Magnetically Controlled Variable Logic
by E. G. Newman and L. F. Winter 30

A New Digital Method of Bit Synchronization Derived from an Analog Theory
by A. J. Anello, A. C. Ruocchio and W. D. Van Gieson, Jr. 31

Simulation of a Hydraulic Actuator
by A. H. Mitchell and K. L. Johnson 329

• *Short Communications:*

A Note on the Resonant Modes and Spatial Coherency of a Fabry-Perot Type Interferometer
by G. J. Y. Fan 335

Analysis of a Nondegenerate Two-Photon Giant-Pulse Laser
by R. L. Garwin 338